

## SCBA Cylinder Inspection Guide Carbon Fiber Composite Cylinders

### WARNING

Do not refill any cylinder that is damaged. Damaged cylinders may suddenly leak or rupture if charged with compressed air. Failure to carefully inspect for damage, following these and the manufacturer's instructions, and to empty the air from damaged cylinders and remove them from service may result in injury or death.

The purpose of this document is to supplement, not replace, the inspection procedures recommended by the manufacturer of the cylinders. It is limited to a discussion of the outside wall of the cylinder. Refer to the cylinder manufacturer's instructions for inspection of cylinder neck, threads and the interior. If you have any questions regarding this document or regarding a cylinder's condition, refer to the cylinder manufacturer's instructions or contact Scott Health and Safety at 800-217-7257.

### Cylinder Construction

Carbon Fiber composite breathing air cylinders used with SCBA are made up of an aluminum alloy liner, covered with a layer of black, carbon fiber composite, which is covered with a layer of light grey, composite glass fiber which is finally covered with a clear gel coat. See Figure 1.

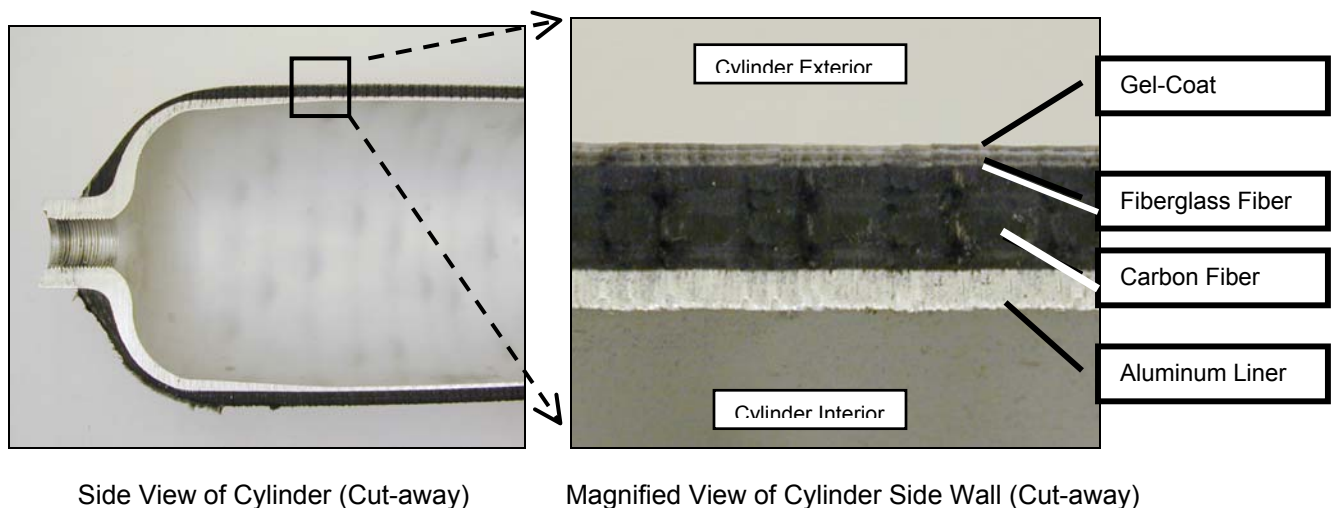


Figure 1

It is important to understand the construction of a cylinder to be able to properly inspect it. Information like a frosty area in the gel coat, visible damage to the fibers or surface damage that exposes underlying layers of composite are critical to the inspection procedure.

## Cylinder Inspection

Cylinder damage or defects are categorized in three levels, identified as Level 1, Level 2, or Level 3. These levels of damage and the actions you must take, are discussed below.

### Level 1 Damage / Defects

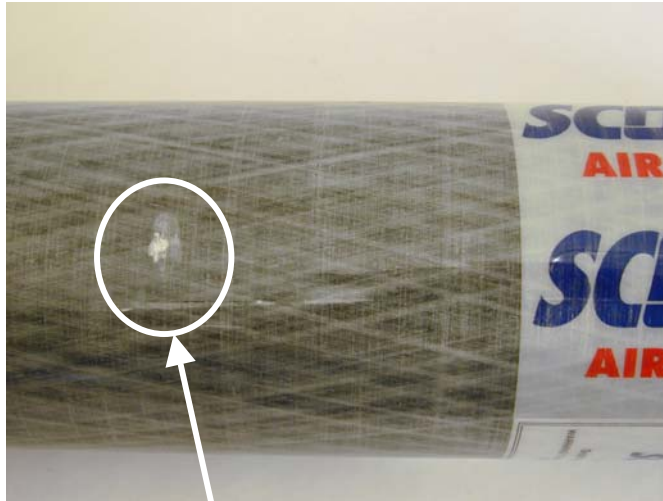
Level 1 damage or defects are identified by scratches or minor damage to the outer coating of the cylinder, the gel coat. The cylinder may also exhibit a slight discoloration of the outer coating, particularly if the cylinder has been exposed to high levels of heat, such as a fire. Typically, the discoloration will be amber or light brown in color. This level damage or defect does not require the cylinder to be removed from service. Slight discoloration of the outer coating does not require removal of the cylinder from service unless the labeling of the cylinder in the gel coat has also turned brown or black, or the labels on the surface of the gel coat are slightly charred. Then the cylinder should be classified Level 2. See the photograph in Figure 2. Areas of the cylinder exhibiting Level 1 damage are to be monitored for possible additional damage.



Figure 2  
Level 1 Damage / Defect (typical)  
Scratches in the outer coating or gel coat of the cylinder.

### Level 2 Damage/Defects

Level 2 damage or defect of the cylinder constitutes damage beyond Level 1, affecting the fiberglass composite layer of the cylinder. This damage will expose the fiberglass composite layer and may further exhibit fraying of the exposed fiberglass composite. See the three photographs in Figure 3. **Cylinders exhibiting Level 2 damage should be removed from service and forwarded to a US Department of Transportation (DOT) authorized hydrostatic testing facility for further inspection or repair.** A listing of the USDOT authorized hydrotesting facilities can be found on their web site: <http://hazmat.dot.gov/ohmforms.htm#hydro>



Level 2 Damage on Side Wall of Cylinder (Highlighted by Circle)



Area in Circle in Above Photo Magnified – Note penetration of Gel Coat (Typical)

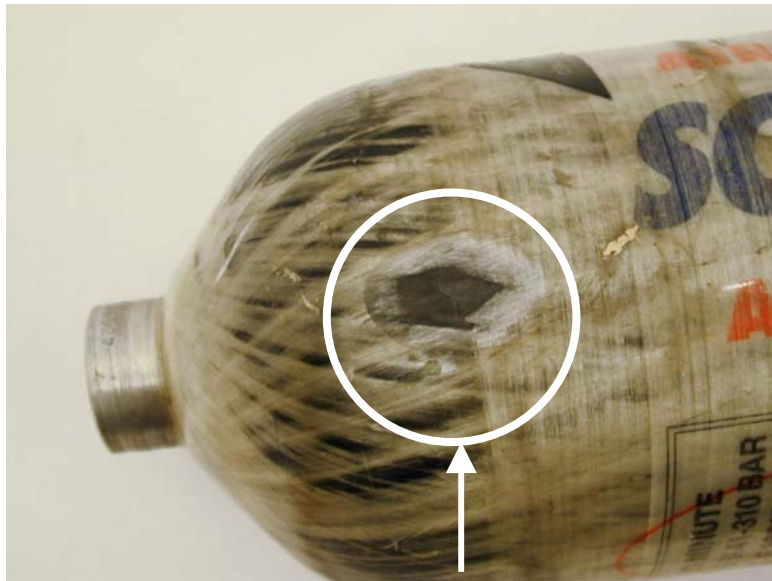


Side View of Damaged Area - Showing Some Fiber Breakage

Figure 3  
Level 2 Damage Defect – Penetration of Gel Coat

### Level 3 Damage/Defect

Level 3 damage/defect is typified by exposure of the black carbon composite layer. Level 3 damage can also be identified as severe discoloration of the cylinder with the labeling bubbled and charred due to exposure to high heat. See Figure 4. Frosting of the gel coat or visible breakage of the fibers as seen through the gel coat may mean the cylinder is bent, dented or bulging. This can generally be verified by rolling the cylinder along a hard, flat surface and carefully examining the contact between the cylinder and the surface. Bent, dented or bulging cylinders should be classified as Level 3 Damage / defect. Signs of corrosion or other form of chemical attack can be evidenced by changes in color or surface (ie. bubbling or “melting/dissolving”) or the deposition of a foreign substance. These cylinders should be classified as Level 3 Damage/Defect. **Cylinders exhibiting Level 3 damage should be depressurized of air and removed from service.**



Level 3 Damage on Cylinder Crown – See Area in Circle



Level 3 Damage Area in Circle Magnified from prior Photo Note Carbon Fiber Exposed

Figure 4  
Level 3 Damage / Defect  
Exposure of the Carbon Composite Layer